

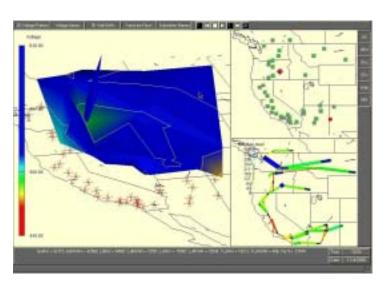
## 1st DOE Distributed Energy Resources Conference and Peer Review



# Philip Overholt Transmission Reliability

November 29, 2001 Washington, D.C.







## **Program Description**



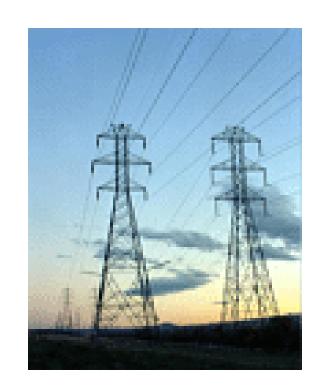
- Initiated in FY 1999 to fill reliability technology R&D gaps not being addressed by private sector
- Workshops held to define agenda for R&D under competitive electricity markets
- Three requirements identified:
  - Information to operate reliable electric system and efficient competitive markets
  - Electric system reliability and markets interlinked
  - Customers need choice for electric energy cost, reliability, and power quality



## Goals



- Develop technologies and policy options that will contribute to maintaining and enhancing the reliability of the nation's electricity delivery system during the transition to competitive markets.
- By 2010 implement a smart, switchable grid to support electric system reliability and electricity commerce.





## **Activities**



- Real Time Grid Reliability Management
  - Visualization tools that allow display of system conditions
  - Development of real time measurements to detect and mitigate impending outages
- Reliability and Markets
  - Perform simulation and experiments to examine behavior of proposed market structures
  - Determine value and characteristics of demand response to market prices and system emergencies
- Distributed Energy Resource Integration
  - Develop microgrid concept to study technical challenges in accommodating large penetrations of DER into the distribution system and power grid



## **DER** Integration



- Program support of DER mission and goals
  - Focus on technical aspects of large-scale penetration of DG and storage into the grid.
  - Collect real time information on value of DG/storage to support system reliability, and sell into competitive markets.
  - Determine value of load that responds to prices and to system emergencies.
- The Transmission Reliability program is a DER technology integration activity.
  - Technical integration into a distribution system where grid connected generation has not existed.
  - Economic integration into competitive markets.



## **Program Implementation**



#### Consortium for Electric Reliability Technology Solutions

- CERTS members include:
  - Lawrence Berkeley National Laboratory
  - Electric Power Group
  - Oak Ridge National Laboratory
  - Power Systems Engineering Research Center (PSERC)
  - Sandia National Laboratories
  - Pacific Northwest National Laboratory
- PSERC members currently performing work for DOE include:
  - Cornell University
  - University of Illinois at Urbana-Champaign
  - University of Wisconsin-Madison
  - University of California-Berkeley
  - Washington State University
  - Georgia Institute of Technology



## **Program Implementation**



#### **CERTS Match to Research Needs**

- Multi-disciplinary approach
  - Engineering, economics, regulatory, institutional
- Balance of near and long term R&D
- Independent, third-party analysis
  - Power Outage Study Team (POST) Report –
     March 2000
  - National Transmission Grid Study –

December 2001





## **Partnerships**



#### Development and analysis

- Powel Grid Management Inc.
- Advanced Visual Systems
- Global Enterprise Management
- Electrotek Concepts
- Sentech

#### Demonstrations

- California Independent System Operator (CAISO)
- California Energy Commission (CEC)
- Bonneville Power Administration (BPA)
- National Rural Electric Cooperative Association (NRECA)
- North American Electric Reliability Council (NERC)
- University of California-Irvine (UCI/SCE)
- American Electric Power under discussion
- Tennessee Valley Authority (TVA) under discussion
- New England Independent System Operator (NEISO) under discussion

#### Commercialization

Powel Grid Management, Inc. – under discussion



## **Cross-Cutting Activities**



- California Energy Commission
  - The CEC PIER Program is leveraging Federal funds by supporting work in the program's major activity areas for application in California
  - CEC providing fast track technology transfer for DOE/CERTS developed technologies



## Transmission Reliability Program



#### **Real-Time Grid Operations**

- ➤ Tools and technologies for reliability management and transformation of the grid to an automated switchable network
  - Assessment of need to measure, track, monitor, and predict reliability performance management parameters
  - Tools for reliability management for use by ISO's, security coordinators, control areas, and operating engineers
  - Suite of tools include:
    - VARS
    - Ancillary Services
    - Congestion Management
    - ACE and AIE
    - Near Real-Time Load Forecasting

#### Distributed Energy Resources

- Enhance grid reliability through integration of DER
  - Planning, modeling, and technical issues
  - Micro grid design and integration
  - DER test beds and micro grid demonstrations to address grid interface and reliability management issues
  - Provision of ancillary services from DER

#### RELIABILITY MANAGEMENT IN COMPETITIVE ELECTRIC MARKETS

#### Reliability and Markets

- Develop tools and technologies for market design and testing to promote efficiency and reliability of competitive markets
  - Modeling and simulation of market rules
  - Empirical analysis
  - Development of computational methods
  - Experimental economics
  - Market behavior and impact on system performance

## Reliability Technology Issues and Needs Assessment

- Monitor and identify technology trends and emerging gaps in electric system reliability
  - Technology assessment
  - Competitive market performance
  - Grid reliability research and technology development road map
  - Development of grid reliability metrics and indicators
  - Value of reliability and measuring, monitoring, and tracking of grid reliability
  - Transmission bottleneck assessment

#### Load as a Resource

- ➤ Evaluate load responsiveness to price signals to improve reliability and market efficiency
  - Characterization of loads and assessment of technologies for communicating price signals and demand response
  - Provision of ancillary services
  - Characterization of load response as a function of time for integration in realtime operations and reliability management
  - Assessment of effectiveness of load programs

